YOUNG FORMS OF THREE DAMSEL FISHES BELONGING TO THE GENUS TETRADRACHMUM INHABITING SOUTHERN PARTS OF JAPAN

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YOUNG FORMS OF THREE DAMSEL FISHES BELONGING TO THE GENUS *TETRADRACHMUM* INHABITING SOUTHERN PARTS OF JAPAN[1)]

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With Plates VIII-IX and 1 Text-figure

Small coral fishes of the genus *Tetradrachmum* are so pretty and easy to rearing that they are a favourite in the aquarium. Recently, they are treated in tropical aquarium fish shop, and petted by many amateur aquarists.

Although two species of this genus, *Tetradrachmum marginatum* (RÜPPELL) and *T. aruanum* (LINNAEUS), have been described from the Japanese waters, here in this paper *T. marginatum* is revised to *T. reticuratum* (RICHARDSON) and *T. trimaculatum* (RÜPPELL) is newly reported from our waters.

As the color pattern in each specimen of this genus changes with their growth, the life colors of young fishes reared in the aquarium are described in detail. In addition, their ecology both in natural habitat and captive environment are reported as much as possible. Specimens studied are mainly collected by the divers with Scuba and are all young fishes.

Before going further, I wish to express my hearty thanks to Prof. Kiyomatsu MATSUBARA and Dr. Akira OCHIAI of the Kyoto University, for their kind supervision during the course of this study, and also to Prof. Huzio UTINOMI and Dr. Takasi TOKIOKA of the Seto Marine Biological Laboratory, for their kindness in giving valuable advices and reading the manuscript. I also wishes to thank Mr. Ryônosuke OKUNO of the Suma Aquarium, Mr. Toshio TSUTSUMI of the Shimonoseki Aquarium, Mr. Yoshiaki TOMINAGA of the Tokyo University and Mr. H. INAGAKI of our Aquarium, for their kindness in offering me important samples and data.

Key to the Japanese species of *Tetradrachmum*

1 a. Dorsal soft rays 12 in number; anal fin rays 12 or 13; body whitish, with 2 black vertical bars ..... *T. aruanum* (LINNAEUS)

1) Contributions from the Seto Marine Biological Laboratory, No. 398.

1b. Dorsal soft rays 14 to 16; anal fin rays 13 or 14.
2a. Body light brown, usually with 2 blackish vertical bars..... ..... *T. reticulatum* (RICHARDSON)
2b. Body jetblack, with one whitish blotch as large as eye, on occipital and one on middorsal area on each side..... *T. trimaculatum* (RÜPPELL)

Tetradrachmum aruanum (LINNAEUS)

Misuji-riûkiû-suzume

(Plate VIII, A)

Dascyllus aruanus.—MONTALBAN, 1927, p. 20–23; FOWLER & BEAN, 1928, p. 21–25; OKADA & IKEDA, 1939, p. 198–200, fig. 26; BEAUFORT, 1940, p. 467–468; SMITH, 1949, p. 280, pl. 50; FOWLER, 1954, p. 13–14, fig. 11; WOODS & SCHULTZ, 1960, p. 62–63, pl. 80, E.
Tetradrachmum aruanum.—AOYAGI, 1941, p. 190–192, pl. XIV–fig. 11; MATSUBARA, 1955, p. 871.

SPECIMENS STUDIED.—15 specimens, 25 to 40 mm in standard length, from Minatogawa, Okinawa. T. TSUTSUMI coll. August 1961.

DESCRIPTION.—Dorsal XII, 12; anal II, 12 or 13; pectoral 16 to 18; scales in longitudinal series 24 to 26, with 4 above lateral line. Body depth 1.4 to 1.7 (1.6); head 2.7 to 3.3 (3.1); both in standard length. Snout 3.0 to 3.6 (3.3); upper jaw 3.1 to 3.4 (3.3); eye diameter 2.2 to 2.6 (2.4); interorbital space 2.4 to 2.7 (2.5); depth of caudal peduncle 1.8 to 2.1 (1.9); all in head length.

Body oval in lateral view; dorsal and anal fins angular in shape, 4th or 5th dorsal spine the longest; caudal fin slightly forked posteriorly; pelvic fins long and pointed, just reaches to origin of anal fin when depressed posteriorly; subopercle, preopercle and suborbital finely serrate, opercle with two flat triangular spines; snout never scaled anteriorly.

In life, head and body white, with three broad vertical bars; the first one runs from origin of dorsal to chin, covering head anteriorly, except for clearly white interorbital area; the second placed from about middle of spinous dorsal to pelvic fin; the rest one running from anterior soft dorsal to anal fin; scales slightly bordered with silver; spiny dorsal membranes, basal parts of soft dorsal and anal, and pelvics black; tips of soft dorsal and anal, pectoral, and caudal fins pale.

In formalin, body grayish or brownish white, vertical black bars more or less indistinct, interorbital space yellowish or sometimes blackish.

ECOLOGY.—This species is very commonly found in the coral reefs of Okinawa Islands. Usually they are crowding around spriged corals (*Acropora* spp.), and run into sprigs all together when they meet their enemies (observed by TSUTSUMI).

In the aquarium, they also choice the interspace of coral sprigs or rocks as their hiding-place, and get into them. When the fish is resting between

corals in the night, three vertical black bars on the body become more or less indistinct and are nearly the same as *Acropora*'s color. It is considered that these black and white striped patterns are useful as their protective color. Territory formation of this species is not so distinct as in other Pomacentrid fishes.

REMARKS.—*T. aruanum* is closely associated with *T. melanurum* (BLEEKER), but the latter can be distinguished from the former in the following coloration; the first vertical black bar runs from occipt, the second one runs from origin of spinous dorsal; the fourth black bar, bordered with white, is present on almost all area of caudal fin (Plate VIII, B).

Although it is not yet conclusive that either *T. melanurum* is distributed naturally over the southern coast of Japan or not, almost half number of fishes, which are imported as *T. aruanum* from the Philippine Islands to Japan by tropical aquarium fish trademen, are *T. melanurum*. These two species have often been confused by many aquarists.

Tetradrachmum reticulatum (RICHARDSON)

Futasuji-riûkiû-suzume (new Japanese name)

(Plate IX, C)

Dascyllus marginatus.—MONTALBAN, 1927, p. 24–26; FOWLER & BEAN, 1928, p. 17–20; BEAUFORT, 1940, p. 465–467, fig. 54; KAMOHARA, 1942, p. 26; SMITH, 1949, p. 280, fig. 753.
Dascyllus reticulatus.—WOODS & SCHULTZ, 1960, p. 63–64, pl. 82, B, C.
Tetradrachmum marginatum.—AOYAGI, 1941, p. 192–194, fig. 18; MATSUBARA, 1955, p. 871.

SPECIMENS STUDIED.—6 specimens, 18 to 24 mm in standard length, from Shirahama. (Date unknown)
One specimen, 24 mm in standard length, from Tanabe Bay, Kii Peninsula, R. OKUNO coll. October, 1961.

DESCRIPTION.—Dorsal XII, 14 or 15; anal II, 13; pectoral 19 or 20; scales in longitudinal series 26 to 28, with 4 above lateral line. Body depth 1.4 to 1.6 (1.5); head 2.6 to 2.9 (2.7); both in standard length. Snout 3.5 to 3.9 (3.7); upper jaw 3.0 to 3.3 (3.1); eye diameter 2.3 to 2.5 (2.4); interorbital space 2.4 to 2.7 (2.5); depth of caudal peduncle 1.9 to 2.1 (2.0); all in head length.
Body elliptical in lateral view; dorsal and anal fins angular, first dorsal spine 1/3 as long as second, second spine subequal to third; caudal fin somewhat forked; tip of pelvic fin not so pointed, barely reaching to origin of anal fin. Preopercle, suborbital finely serrate, opercle entire except a flat rounded spine on upper half; scales on snout to tip.

When alive, ground color of body yellowish brown, scales bordered with dark brown, with 2 blackish brown vertical bars, the first one of which is narrower than eye diameter, running vertically from origin of dorsal fin,

through base of pectorals to pelvics, the other one from base of soft dorsal to anterior part of anal; a large whitish blotch placed on middorsal area of body; spinous dorsal fin widely edged with black; soft dorsal fin blackish basally; anal fin also dark brown except for the distal half of its posterior area; pelvic fins uniformly blackish, but pectoral and caudal fins pale. In the aquarium, posterior vertical bar and a large whitish blotch sometimes not distinct. Each color pattern is paticularly distinct when the fish is excited.

In formarin, the color pattern well accords with that of living specimens, except for the following two pigmentations: two vertical bars are somewhat indistinct, and a large blotch on the middorsal area dusky.

ECOLOGY.—One specimen collected by OKUNO resided at the top of a spriged coral (*Acropora* sp.) where the depth was about three meters, together with one of *T. trimaculatum*. It may be considered that this species is, generally, a coral-top inhabitant like *T. aruanum*.

REMARKS.—This species has been considered as a synonym of *Dascyllus marginatus* (RÜPPELL) by many authors, but WOODS and SCHULTZ (1960, p. 64) concluded that it is distinctly different in the following coloration. *D. marginatus* does not possess a dark vertical bar from dorsal origin to pelvic base, but instead has a large dark area covering entire nape and upper anterior sides downward and backward; furthermore, the general ground color is dark greenish brown and the scales are not margined as in *T. reticulatum* but have small brown dots in middle of its bases. Besides, two vertical black bars of *T. reticulatum* disappear, firstly posterior bar and next anterior one, with the growth of the fish.

One specimen of *T. marginatum* recorded by AOYAGI (1941, p. 192-194) from Miyako-jima, Riūkiū and several specimens of *D. marginatus* recorded by KAMOHORA (1942, p. 26) from Shirahama must be *T. reticulatum*, because these specimens all possess a dark vertical bar from dorsal origin to pelvic base.

Tetradrachmum trimaculatum (RÜPPELL)

Mitsuboshi-kuro-suzume

(Plate IX, D)

Dasyllus trimaculatus.—MONTALBAN, 1927, 23-24, pl. 5, fig. 2; FOWLER & BEAN, 1928, p. 14-17; BEAUFORT, 1940, p. 462-465, fig. 53; SMITH, 1949, p. 280, pl. 50; FOWLER, 1954, p. 16-17, fig. 12; WOODS & SCHULTZ, 1960, p. 64-66, pl. 82, A, E.

SPECIMENS STUDIED.—12 specimens, 12 to 26 mm in standard length, from Shisō-jima, Shirahama. C. ARAGA coll. October 1960. 7 specimens, 10 to 25 mm in standard length, from Tô-shima, Shirahama. H. INAGAKI coll. September 1961. 15 specimens, 18 to 42 mm, from Tanabe Bay, Kii Peninsula. R. OKUNO

coll. October 1961. 2 specimens, 20 and 35 mm, from Rinkai-ura, Shirahama. H. INAGAKI coll. September 1962.

DESCRIPTION.—Dorsal XII, 14 or 15; and II, 14; pectoral 19 or 20; scales in longitudinal series 27 or 28, with 4 above lateral line. Body depth 1.5 to 1.7 (1.6); head 2.8 to 3.2 (3.0); both in standard length. Snout 3.3 to 3.8 (3.6); upper jaw 2.6 to 3.1 (2.8); eye diameter 1.9 to 2.2 (2.0) interorbital space 2.3 to 2.6 (2.4); depth of caudal peduncle 2.1 to 2.3 (2.2); all in head length.

Bony oval in lateral view; dorsal and anal fins angular in shape, 2nd and 3rd dorsal spines longest, caudal fin slightly rounded posteriorly in smaller specimens (10 to 13 mm in standard length), but straight (13 to 18 mm) or merely forked (18 to 42 mm)in larger one; pelvic fin long, somewhat pointed, usually reaching to base of 2nd anal spine; preopercle and suborbital with numerous minute serrations; opercle with a broad flat triangular spine medially, and finely serrated along its lower margin; snout entirely covered with serrated scales.

In life, head and body jetblack, with three silvery or slightly bluish white blotches, which are as large as eye, one on middle portion of each lateral line and one above interorbital area; spiny dorsal, basal half of soft dorsal, pelvics and anal fin black; caudal fin uniformly black except for light tip of its upper lobe; pectoral fin pale, with a very small black spot just above upper edge of the base.

In formalin, head and body dark reddish brown to brownish black; blotches on lateral line and head uniformly yellowish; general color of each fin somewhat brownish; distal half of soft dorsal and pectoral fin grayish; small black spot above upper edge of pectoral base more distinct in preserved specimens.

ECOLOGY.—Collected specimens were all young fishes (less than 42 mm in standard length), but I found an adult (about 100 mm in total length) in October 1960 from under-water observation with Scuba in Tanabe Bay.

All specimens observed or collected from the waters near Shirahama, except for several one resided at the top of corals, inhabited around the sea anemone *Parasicyonis actinostoloides* WASSILIEFF stuck to the reef in the depth of 2 to 7 meters. Smaller specimens never left from the side of the sea anemone when the diver approached, while large one (up to about 40 mm in total length) left their habitat and escaped along the reef. Therefore, it is considered that as the fish grows to a greater size, it may show less dependence to the sea anemone as hiding-place.

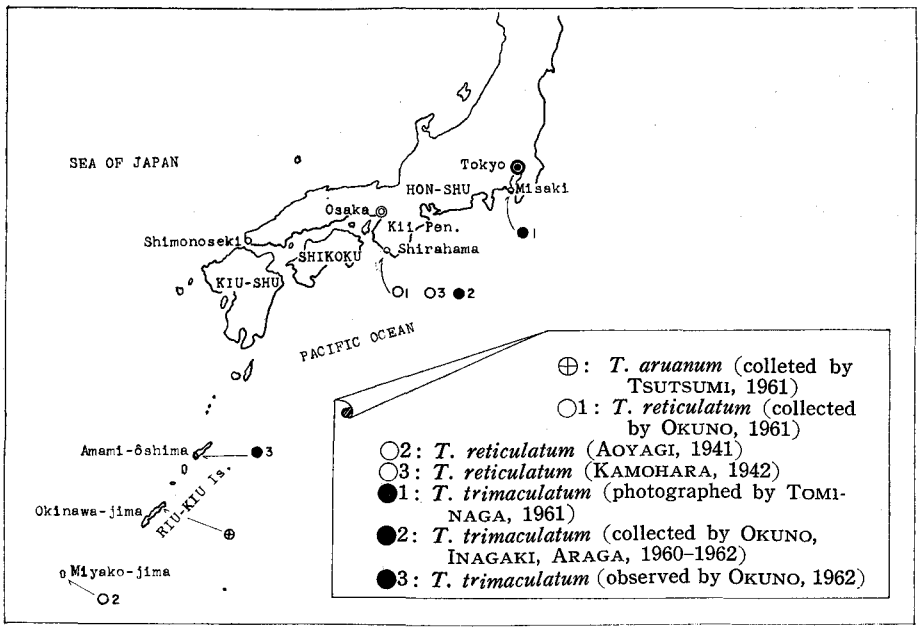
In natural waters, I observed several specimens crowded around one sea anemone, and struggle for territory was not recognized. On the other hand, in the aquarium, the territory formation was often observed and it is rather distinct when many sea anemones existed together in the tank and then each fish could occupy one or more sea anemones.

T. trimaculatum never get into the tentacles of sea anemone not as the anemone fish *Amphiprion xanthurus* CUVIER & VALENCIENNES, but usually hide itself at the back side of spread tentacles or basal part of sea anemone. Even the fish is sometimes in contact with the tentacles, nothing of conducts that the fish is attacked by sea anemone's nematocyst, is observed. So, it may be considered that there are also a kind of glands which secrete anti-nematocystic substances similar to that of *Amphiprion*, in the epidermis of this fish.

Foods transportation behaviour for sea anemone, usually observed on *A. xanthurus* (see OKUNO, 1959), was not at all recognized in the case of *T. trimaculatum*.

Distribution of *Tetradrachmum* in Japan

The distributions of these three species of *Tetradrachmum* in the southern parts of Japan are shown in Text-figure 1.



Text-fig. 1. Distribution of *Tetradrachmum* in Japan.

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EXPLANATION OF PLATES VIII–IX

PLATE VIII

A. Living specimen of *Tetradrachmum aruanum* (LINNAEUS), 32 mm in standard length.

B. Living specimen of *Tetradrachmum melanurum* (BLEEKER), 31 mm in standard length.

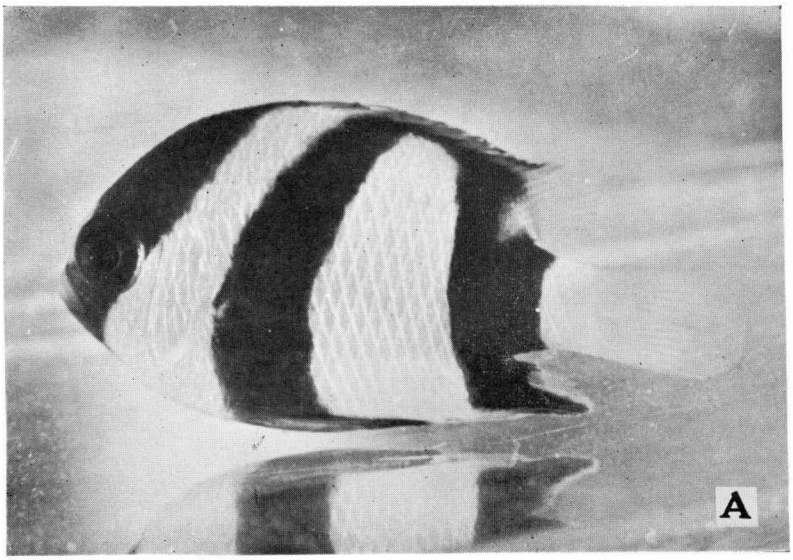
Photographed in the Shirahama Aquarium by Ch. ARAGA.

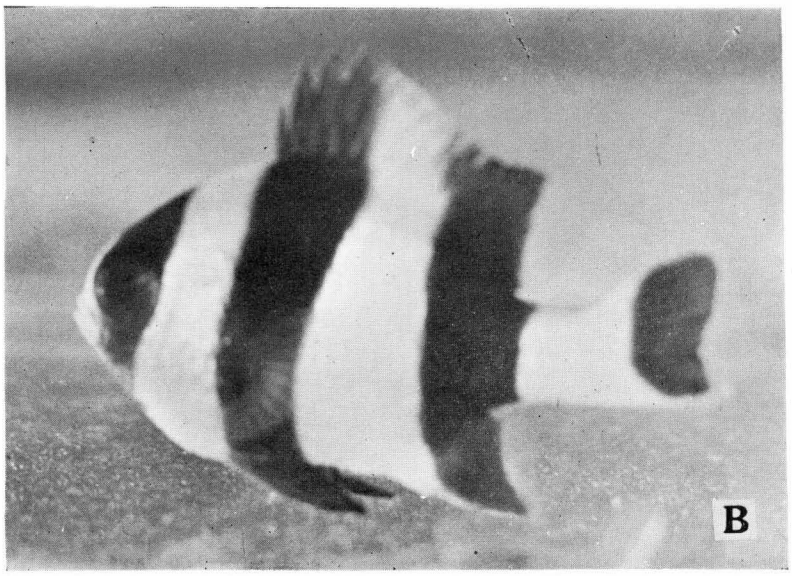
PLATE IX

C. Living specimen of *Tetradrachmum reticulatum* (RICHARDSON), 24 mm in standard length.

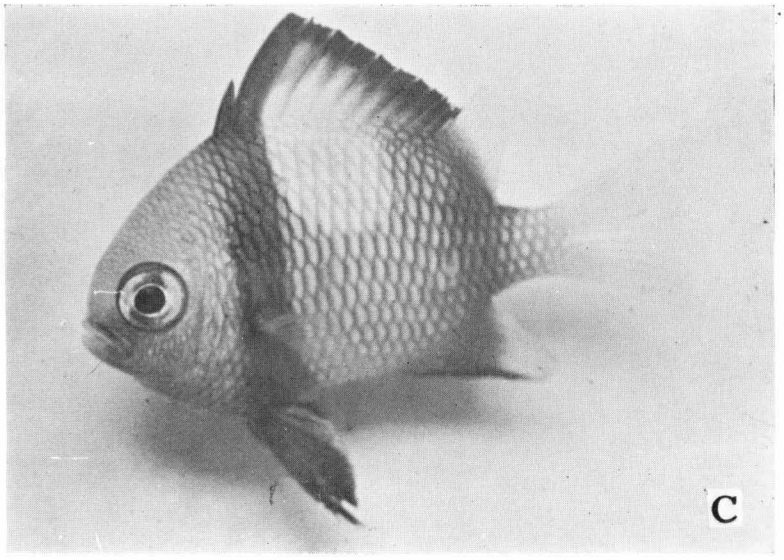
D. Living specimen of *Tetradrachmum trimaculatum* (RÜPPELL), 28 mm in standard length, and the sea anemone *Parasicyonis actinostoloides* WASSILIEFF.

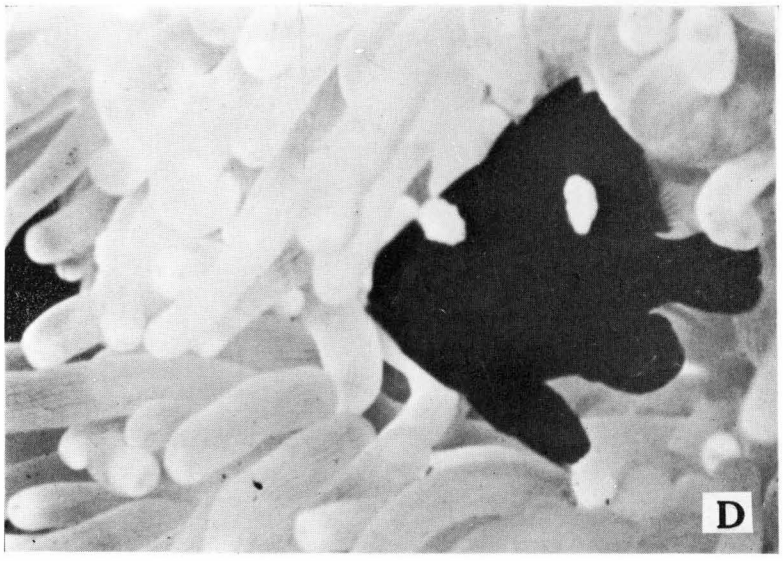
Photographed in the Suma Aquarium by R. OKUNO.





CH. ARAGA: YOUNG FORMS OF THREE DAMSEL FISHES *TETRADRACHMUM*.





Ch. Araga: Young Forms of Three Damsel Fishes *Tetradrachmum*.